PATENT APPLICATION

FOR

METHODS AND SYSTEMS FOR BILLING AND ROUTING LOCAL TOLL-FREE CALLS

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CROSS REFERENCE TO CONTINUATION

[0001] This application is a continuation of applicant's co-pending U.S. Patent Application 09/498,684, entitled "Methods and Systems for Billing and Routing Local Toll-Free Calls," (Attorney Docket BS99156/KS99156) filed on February 7, 2000, and of which is incorporated herein by reference.

FIELD OF THE INVENTION

[0002] This invention generally relates to the field of telecommunications. More particularly, this invention relates to methods and systems for billing and routing toll-free calls based on the local geographics of the originating number and of the terminating number.

BACKGROUND

[0003] Toll-free calls, also known as Inward Wide Area Telephone Service (INWATS) calls, allow a long distance subscriber to reverse the charges by permitting originating parties to call the subscriber without accruing long distance charges. In the United States, toll-free service is currently available for intrastate and interstate calls. Over the last twenty years, the volume of toll-free calls has increased to the extent that its traffic has become a substantial percentage of all toll calls. Toll-free service is especially useful for entities such as reservation call centers, retail call centers, hospitals, emergency hotlines, professional services, retail dealers, radio/TV promotions, government call centers, and education call centers.

[0004] An entity will often have a single advertised toll-free telephone number that is applicable to multiple locations and multiple services. Having a single advertised number helps to eliminate the expenses which would otherwise be associated with advertising the different locations and services with a different phone number for each. Additionally, advertising a single toll-free number can make it easier for a caller to remember the entity's phone number and easier to access multiple services with one phone call. For example, this is especially true for a nationally franchised pizza delivery business having a large number of business establishments all providing common goods and services. This allows a customer to remember one toll-free

number that can be called from any location in the United States and routed to a local business establishment to order a pizza for local delivery.

[0005] In general, toll-free service connects an originating number through a series of switches connected to a long-distance carrier's communication network. The network queries a database to validate the toll-free number and to select a directory number (DN) for the terminating location of the toll-free number. The terminating number is then communicated to the long-distance carrier's switch and the call is routed via direct access or via local switches serving the terminating number.

[0006] There are numerous methods for routing toll-free calls. For example, U.S. Patent No. 4,191,8660 of Weber, discloses a routing method to access one of a number of reservation offices of a national airline using a common toll-free telephone number. According to Weber, a caller dials a toll-free number which together with the numbering plan area code (NPA, the first three digits of the caller's ten digit number) is used along with the toll-free number dialed by the caller to access a database to translate the toll-free number into a terminating number in the form of a Plain Old Telephone Services (POTS) number to which the call is routed. Since the translation compares the caller's NPA and the dialed toll-free number, callers from different NPAs may be routed to different reservation offices. Furthermore, the use of the translation permits out-of-hours traffic to be routed to a different set of reservation office than busy hour traffic.

[0007] Another routing example is U.S. Patent No. 5,878,126 of Velamuri, et al., which discloses a method and system of routing an originating number to a particular subscriber location within a plurality of subscriber locations based on the geographic area from which the call originated. The method includes identifying the originating number with a specific location identifier indicating the location of the originating number, providing a range table of selected ranges of location identifiers and if the specific location identifier is within one of the selected ranges of the range table, the call is routed to the terminating number corresponding to the selected range containing the specific location identifier. If the specific location identifier is not

located within one of the selected ranges, the call is routed to the terminating number corresponding to the specific location identifier located in an auxiliary database containing subscriber locations.

[0008] U.S. Patent No. 4,757,267 of Riskin discloses a toll-free telephone system that routes an originating call to one of many nearby dealers (terminating numbers) based upon the coordinates of the originating number and upon the coordinates of the central office serving the dealer. A comparison is performed between the originating number and geographic locations of one to three selected nearby dealers. The system automatically dials the terminating number of the closest dealer thereby routing the originating number. If the terminating number is busy or does not answer, the system can attempt to call an alternate nearby dealer if one exists. The system further provides for billing each nearby dealer based on the number of incoming telephone calls and for reporting to each dealer the details of the incoming calls. This system can be uneconomical for local dealers and central offices.

[0009] U.S. Patent No. 5,136,636 of Wegrzynowicz discloses a method for selecting a local dealer out of a large group of dealers for completion of a toll-free number. The caller is first connected to a toll switching system. That system sends a query to a first database using the toll-free number and the geographic information of the originating number. The first database responds with a routing number which is used to route a second query to one of a plurality of second databases. The second query uses the routing number and the geographical information of the originating number to access the second database and to obtain the terminating number of a local dealer. The terminating number is returned to the toll system for completing the call.

[0010] While each of these patents disclose methods for routing toll-free calls based on geographic information of the originating number and of the terminating number, none discloses a method for routing a local toll-free call via direct access by a local service provider. The term "local toll-free call" is used as a term of art herein to mean a toll-free call wherein the originating

number and the terminating number (i.e., the toll-free number) are in the same Local Calling Area (LCA) or are in the same Local Access and Transport Area (LATA).

[0011] Today's toll-free subscribers are billed based on toll tariff rates and a variety of factors, such as, the number of subscriber lines, monthly hours of usage, time of day, and other factors. However, local toll-free calls are eligible for billing based on local tariff rates at substantially less cost to the subscriber. Despite this eligibility for discounted local toll-free billing, current industry practice is to bill toll-free subscribers either a fixed amount or a flat-rate per minute for each incoming call regardless of whether the toll-free call is considered local or toll. In addition, subscribers are not given the flexibility to allocate subscriber locations based on billing discounts. For example, a subscriber cannot assign geographic calling areas to a terminating number based on billing discounts.

[0012] Thus, there is a need in the art to provide toll-free methods and systems to bill and route local toll-free calls via local service providers. Similarly, there is a need in the art to provide subscribers with the flexibility to route incoming local toll-free calls based on discounted local toll-free billing, demographic information of originating numbers, call volumes, times of day, and other factors.

SUMMARY

[0013] Stated generally, this invention includes methods and systems for routing local toll-free calls via local service providers. The methods and systems allow local service providers to market new services to their customers. The methods and systems may be particularly advantageous to toll-free subscribers who are in large metropolitan areas or who desire to provide only a single toll-free number to their callers and receive a large number of calls from within their own LCA and intraLATA.

[0014] Current toll-free systems involve routing an originating call through the local switches and Service Control Point (SCP) of a Local Service Provider (LSP) to a subscriber's

interexchange carrier (IXC) who provides long distance transmission of the call. A LSP is a provider of local access functionality to an originating party (i.e., the party placing the toll-free call). The IXC pays the LSP for servicing the call, in the form of an "originating access charge." Thereafter, the IXC can route the toll-free call via their own dedicated access to the subscriber's terminating number or via an LSP switch that services the geographical area of the terminating number. If the IXC uses the LSP to route the originating call to the terminating number, then the IXC pays the LSP a "terminating access charge."

[0015] The system routes the originating call through the local switches to a regional SCP associated with a LSP. The SCP receives the dialed toll-free number and queries the 800 Service Management System (SMS) database to translate the dialed toll-free number to the terminating number. The SCP then examines the originating number and the terminating number to determine if the toll-free call is within the same LATA or if the toll-free call is outside of the LATA. If the toll-free call is within the same LATA, the originating call is routed via participating local switches to the terminating number. If the toll-free call is outside of the LATA, the call is routed to the IXC for further processing and routing.

[0016] When an originating party calls the subscriber paying for the toll-free service, the originating party dials the digits "800", "888", "877", "866", "855," or another toll-free three (3) digit prefix, in place of an Numbering Plan Area (NPA) code that is used with the DN. An NPA code is the initial group of three (3) digits of a North American Numbering Plan (NANP) number that divides the United States into geographical "area codes." The format of an NPA number is NXX, where N is any digit from 2 to 9 and X is any digit from 0 to 9. The format of a DN is NXX-XXXX. Since the three (3) digit toll-free prefix (i.e., 800, 888, 877, 866, 855, etc.) does not designate a particular geographical location for termination, the prefix represent a "virtual" telephone number referred to as a service access code (SAC). Hence, the ten digit toll-free number (e.g., "800-NXX-XXX") must be translated to the terminating number (e.g., "NPA-NXX-XXXX). Thereafter, the local SCP routes the originating call based upon the wire center (using the NPA-NXX) or to a block group (using the entire NPA-NXX-XXXX) of the

originating number and based upon the NPA-NXX of the terminating number. Routing may also be distributed among multiple participating LSPs that service the terminating number.

[0017] As mentioned above, a subscriber can chose wire center routing (using the NPA-NXX) or granular block group routing (using the entire NPA-NXX-XXXX). Block groups are defined for the entire United States by the Census Bureau and typically encompass a much smaller geographic area than a wire center. This gives a subscriber a greater degree of flexibility in defining which geographic areas should be routed to which subscriber locations. At the time of the initial subscription, the subscriber assigns the wire centers or block groups within its service area to the subscriber locations to which calls for these geographic areas should be routed to determine billing.

[0018] The system works in conjunction with a subscriber's existing toll-free service provider (IXC). FCC guidelines allow a toll-free subscriber to select a long distance carrier (IXC) for toll calls and one or more local carriers (LSPs) for local calls. Thus, a subscriber can have two or more different carriers serving its toll-free service.

[0019] To develop competitive offers to subscribers, a local communications network's SCP first compares the originating number with the terminating number to classify the call as local or toll for routing and billing. A call eligible for local delivery to a participating LSP may be billed to the subscriber according to local discount rates set forth in a local toll guide. On the other hand, a call that is not eligible for local delivery (i.e., the call is long distance or there is no participating local LSP) is routed via current industry practice and is generally billed to the subscriber according to its arrangement with the long distance toll-free service provider.

[0020] The local toll guide may work in conjunction with a subscriber's existing toll-free service provided by another carrier (IXC). According to the local toll guide, the subscriber may be provided two unique local toll-free rates -- one rate for calls within the LATA outside of their Local Calling Area (LCA) and another rate for calls within their LCA. There may also be

volume and term discounts. Volume may be determined using the aggregate total of all intraLATA toll-free minutes of use (MOUs) for all toll-free numbers. Term may be determined by the number of months (i.e., 6 months, 12 months, 18 months, etc.) committed to the participating LSP.

[0021] In another aspect the system may allow a subscriber to modify its own database(s) of terminating locations directly. The database contains information based on originating numbers, dialed toll-free numbers, locations of terminating numbers, call volumes, times of day, routing features, and other aspects. In accordance with prior practice, a subscriber is provided with a toll-free number which is used to access the subscriber's database(s) for modification. After the subscriber dials the database with its toll-free number, the subscriber is routed to an interface that allows the subscriber to log on. The subscriber specifies an NPA code or an NPA-NXX code for which the subscriber wishes to modify the terminating numbers in the database. The system queries the INWATS database to identify the particular database that contains translation information for that subscriber and that NPA code(s). The subscriber is then routed to that database and enters changes. After completion of changes for a particular NPA, the subscriber is returned to the main menu where the subscriber can enter another NPA or NPA-NXX code. While this feature may be provided for some subscribers, others may have their database modified by the LSP by submitting a work order to begin the process.

[0022] It is another aspect of this invention to provide a method of billing that incorporates geographic locations of the originating number and/or terminating number according to Number Portability (NP). That is, an NPA-NXX is considered to be ported when any subscriber previously served from an End Office (EO) associated with the NPA-NXX moves to another LSP and keeps the same 10-digit NPA-NXX-XXXX.

[0023] It is another aspect of this invention to provide call routing instructions based on different billing categories of geographic locations of the originating number and terminating number.

[0024] It is another aspect of this invention to provide local toll-free billing and routing in conjunction with toll-free number enhanced features.

[0025] It is another aspect of this invention to minimize the number of queries to databases to obtain call billing instructions.

[0026] It is another aspect of this invention to minimize the number of queries to obtain call routing instructions.

[0027] The aspects, features and advantages of present invention are described in more detail below with reference to the embodiments depicted in the attached figures. Further aspects, features, and advantages of this invention will be apparent from the description provided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] Other aspects, features, and advantages of the invention will be more clearly understood by reference to the following description taken in connection with the accompanying figures, in which:

[0029] Fig. 1 illustrates an embodiment of the routing of a toll-free call that has an originating number and a terminating number in the same LATA;

[0030] Fig. 2 is a flow diagram of the steps implemented in an embodiment of routing an originating number to the SCP database server;

[0031] Fig. 3 is a flow diagram of the steps implemented in an embodiment of routing a terminating number to a participating local switch to complete the local toll-free call; and

[0032] Fig. 4 illustrates a local toll-free billing statement with detailed call information and billing rates in an embodiment of this invention.

DETAILED DESCRIPTION

[0033] Figure 1 illustrates the routing of a toll-free telephone call. Fig. 1 shows an originating party (originating number) **101**, who lives in Local Access and Transport Area-1 (LATA-1) **114**. LATA is a term that refers to the local geographical areas within the United States wherein participating LSPs provide local transmission services via local switches, such as, Network Access Points (NAPs), Service Switching Points (SSPs) and Signaling Transfer Points (STPs). In a LATA that comprises a large metropolitan area, there are often numerous LSP providers.

[0034] Long distance transmission of calls is provided by IXCs. Therefore, IXC refers to the long distance carriers that route calls between the LATAs. Again, there are numerous IXC providers that a subscriber can use for toll-free services.

[0035] The IXCs interface with the LSPs at Points-of-Presence (POPs) within the LATAs. Therefore, a POP is the physical location within the LATA wherein the IXC provides access to its long distance network. The IXC network has an IXC POP **115** in LATA-1 **114**.

[0036] As shown in Fig. 1, the originating party **101** resides in LATA-1 **114**. Local telephone calls for LATA-1 are handled by LSP-1 **113**.

[0037] LSP-1 **113** for LATA-1 **114** includes the following as part of its network: switches SSP **102**, STP **104**, and SSP **109**; SCP **105**; and 800 Database (DB) **106**.

[0038] A Service Management System (SMS) **107** is an Advanced Intelligent Network (AIN) operations system designed to manage software updates, service data updates, service subscriber data update, and provide subscriber service reports. The SMS **107** provides the data necessary to

translate a "virtual" toll-free number (e.g., "800-NXX-XXX") to a terminating number (e.g., "NPA-NXX-XXXX").

[0039] When an originating party **101** places a toll-free call to a subscriber, the call traverses the path shown in Fig. 1. LSP-1 **113** for LATA-1 **114** routes the call to SSP switch **102**. Then SSP switch **102** routes the call to the CCS7 Network **110**. A query is issued to translate the dialed toll-free number **103** and is routed to STP switch **104**. SCP **105** accesses the 800 database **106** provided by SMS **107** to translate the toll-free number **103** into a terminating number that has the form of NPA-NXX-$XXXX_t$. SCP **105** examines the originating number **101** (NPA-NXX-$XXXX_o$) with the terminating number **114** (NPA-NXX-$XXXX_t$) to classify the call as local or as toll. For example, that examination can begin with a simple comparison of the NPAs of the originating and terminating numbers. If the SCP determines that the NPAs are the same (e.g., both the originating and terminating number have the same area code), it may identify the call as a local call. In some areas and with the increasing spread of mobile phone numbers and Local Number Portability, however, that comparison alone may not suffice. Thus, the SCP may instead compare the originating and terminating numbers to a database that lists all NPA-NXX numbers that comprise particular LATAs.

[0040] Thereafter, STP **104** routes **108** the local toll-free call to SSP switch **111**. SSP switch **111** routes the local toll-free call to the terminating party **114** for completion. If the toll-free call is categorized as toll, STP **104** routes **109** calls to IXC POP **115** for transmission to the IXC network for completion.

[0041] Fig. 2 is a flowchart illustrating the routing of the originating number (NPA-NXX-$XXXX_o$) to the local communications network. An originating party dials a toll-free number (e.g., "800-NXX-XXXX") **201**. Local switches route the originating party to the local communications network **202**. The local communications network translates the toll-free number to a terminating number (NPA-NXX-$XXXX_t$) **203**. Next, the local communications network

compares the origination number (NPA-NXX-$XXXX_o$) to the terminating number (NPA-NXX-$XXXX_t$) **204**.

[0042] Fig. 3 is a flowchart illustrating the routing of the terminating number from the local communications network. First the local network classifies the toll-free call as local or as toll based on a comparison of the origination number (NPA-NXX-$XXXX_o$) to the terminating number (NPA-NXX-$XXXX_t$) **301**. If the origination number (NPA-NXX-$XXXX_o$) and the terminating number (NPA-NXX-$XXXX_t$) are outside the same LATA, the call is classified as toll and routed to the subscriber's IXC network **302**. If the origination number (NPA-NXX-$XXXX_o$) and the terminating number (NPA-NXX-$XXXX_t$) are within the same LATA, the call is classified as local and routed from the local communications network to the participating local switch serving the terminating number **303**. Finally, each originating local switch creates a local toll-free call record **304**. The local toll-free call record contains information for the call, including but not limited to: geographic locations, minutes of use (MOUs), routing, call features and troubleshooting information **305**. Multiple toll-free call records are thereafter combined into a billing block.

[0043] Fig. 4 illustrates a portion of a local toll-free billing statement in an embodiment of this invention. The statement provides detailed call information for each originating call including originating number, geographic area, time of day, length of call, terminating number, eligibility for local toll-free discounting, and amount billed for each call.

[0044] Further details and embodiments of the invention are illustrated in the following table and examples. Table 1 provides an example of billing rates for this invention so that rating Examples 1, 2, and 3 can be explained.

TABLE 1: LOCAL TOLL-FREE RATES

Volume Commitment	Initial Period up to 30 secs	Local rate / min	Initial Period up to 30 secs	Toll Rate / Min
VOLUME-0	0.0345	0.069	0.042	0.084
VOLUME-A	0.0325	0.065	0.0395	0.079
VOLUME-B	0.0305	0.061	0.037	0.074
VOLUME-C	0.0285	0.057	0.0345	0.069
VOLUME-D	0.0255	0.051	0.032	0.064
VOLUME-E	0.0245	0.049	0.0295	0.059
VOLUME-F	0.0235	0.047	0.02825	0.0565

EXAMPLE 1:

[0045] A local toll-free call appears on the bill for 0.5 minutes. The subscriber is a VOLUME-0 subscriber with no commitment. The local toll-free call would be rated at 0.5 x .06900 = 0.03450. The call would be truncated to the penny so the call would be rated at 0.03 on the bill.

EXAMPLE 2:

[0046] An IntraLATA call appears on the bill for a VOLUME-A subscriber that is 0.7 minutes. The call would be rated at 0.7 X 0.079 = 0.0553. The amount would be truncated and would rate on the bill at 0.05. Notice the call is not rounded, it is truncated, although rounding can be implemented

[0047] By way of further example, term discounts are set at 5% for a 12 month commitment, 8% for a 24 month commitment and 11% for a 36 month commitment. Discounts associated with the Term plans are applied on the per minute rate.

EXAMPLE 3:

[0048] A local toll-free call appears on the bill for 4.8 minutes. The subscriber has a VOLUME-F commitment with a 24 month term. This term would give him an additional 8% discount. The applied rate for this subscriber would be the local toll-free rate for VOLUME-F

times 1-0.08 discount. (4.8 x (0.0235 x1-0.08)). The easiest way to understand this is to determine the discount. 1-0.08 means the subscriber is paying 0.92 or 92% of the rate for someone without a discount, or: 0.92 X 0.0235 = 0.02162. To determine the charge to bill, multiply 0.02162 X 4.8 = 0.103776 or $0.10.

EXAMPLE 4:

[0049] Using the system, providers of toll-free telecommunications services can substantially reduce the charges they bay to telecommunication service providers. By way of example, suppose Delta Airlines purchases an "800" number service from AT&T. Calls to the 800 number are terminated to Delta's Atlanta headquarters. Each time a Delta passenger passing through the airport in Atlanta calls Delta's 800 number for flight information, etc., Delta pays AT&T for that toll-free call -- even though the call is a local one. Using this invention, calls directed to Delta's 800 number that are local in nature are, in fact, identified as a local call and routed via a local service provider that Delta chooses, such as BellSouth. Because the call is properly treated as a local one, the charge to Delta for the customer to make the 800 call is less than Delta would normally pay for such an 800 call.

[0050] In other embodiments, the system allows the subscriber to modify a database of originating numbers, dialed toll-free numbers, locations of terminating numbers and/or specific terminating number, call volumes, times of day, routing features, and other aspects for the subscriber's toll-free numbers. For example, the subscriber may logon to an information system to access and configure local toll-free billing for one or more of it's toll-free numbers. The subscriber may specify an NPA code or an NPA-NXX code for which the subscriber wishes to modify the terminating numbers in the database. The system queries the INWATS database to identify the particular database that contains translation information for that subscriber and that NPA code(s). The subscriber is then routed to that database and enters changes. After completion of changes for a particular NPA, the subscriber is returned to the main menu where the subscriber can enter another NPA or NPA-NXX code. While this feature may be provided

for some subscribers, others may have their database modified by the LSP by submitting a work order to begin the process.

[0051] The foregoing description, associated figures, rate table, and billing examples detail only illustrative embodiments and are not intended to be limiting. For instance, the hardware described in Figure 1 and mentioned in the description are by way of example only, and this invention may always be enhanced to incorporate the most advanced available technology. By way of example, the network elements by which this invention may be deployed within a telecommunications network can comprise an established network element (such as an SCP, STP, or SSP, an intelligent peripheral or a computer workstation with an appropriate processor, database and network links). In addition, the billing statement in Figure 4 is by way of example only and is meant to represent only a portion of a billing statement. Similarly, the rates in Table 1 and billing examples in Examples 1, 2, and 3 are illustrative only and the rates and billing calculations can be varied and changed at any time. From the teaching of the present description, associated figures, rate table, and billing examples, the person skilled in the art will be able to implement the invention with different embodiments.